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# Severity of Illness and the Teaching Hospital

*Richard A. Berman, Jesse Green, Ph.D., David Kwo, Keith F. Safian, and Lee Botnick*

**Abstract**—In the current environment of cost containment pressures on health care providers, teaching hospitals are facing increased financial risks that could jeopardize their special role in the health care delivery system. One of these risks is that the Medicare prospective payment system does not adequately account for severity of illness. Whether teaching hospitals treat a case mix of patients with more severe illness than do nonteaching hospitals was tested in the study reported here using two severity measures, Horn's severity of illness index and Gonnella's "disease staging." Teaching hospitals were found to treat a significantly greater proportion of severely ill patients than community hospitals, especially when measured by the severity of illness index. Differences in case mix of severity of illness among hospitals can have a significant impact on patient care costs, which may not be adequately met by a reimbursement system based on diagnosis related groups. Hospital managers can use severity of illness measures to assess the resource needs of patients and the practice patterns of physicians. If severity of illness measures help describe the special burden of treatment that teaching hospitals bear, they should be used to establish the case for adequate financial support.

Many studies have concluded that the average cost of treating a patient in a teaching hospital is significantly greater than in a community hospital (1). In the past, society has been willing to support this cost difference in order to train the next generation of physicians, expand the pool of medical knowledge, develop new medical technology, and provide quality health care to the poor. Now, with an ever increasing emphasis on containing the cost of health care, providers are under intensifying pressures to reduce prices to consumers, third-party payers, and business. These pressures have resulted in increased competition among providers for patients and in new reimbursement methods designed to create incentives for hospitals to use fewer resources per patient. With so much emphasis on cost reduction, there is concern that teaching hospitals, despite the important contributions they make to health care and edu-

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cation, may lose the financial support they have traditionally had.

The prospective payment system (PPS), enacted by Congress in 1983 for the Medicare program, defines hospital output in terms of 470 diagnosis related groups (DRGs). Each DRG has a cost weight or reimbursement rate that is intended to reflect the relative intensity of treatment necessary for patients in that DRG. Payment per case, then, is directly based on the cost weight of the patient's assigned DRG.

Under the PPS, the DRG cost weights are the sole basis for comparing the case mix of different institutions. Yet, these weights have been criticized as being based on inadequate data from too few cases and as being outdated (2). In addition, the cost weight for each DRG was derived by using a single ratio of costs to charges for all hospitals, regardless of experiences at individual hospitals. If it is true that teaching hospitals have underpriced their specialized and high-cost services (for example, immunopathology) and overpriced their routine services (for example, normal maternal delivery), the DRGs requiring the most intensive treatment would not be fully reimbursed. Thus, the DRG system penalizes teaching hospitals.

Perhaps the most important criticism of the PPS system by teaching hospitals is that severity of illness is not adequately reflected by the DRGs. This view is based in part on the wide variation in resource use within DRGs, even within institutions with the same physician attending. As part of a study of the homogeneity of the DRG categories, the authors of the present study examined a sample of 12,136 cases at the New York University (NYU) Medical Center in 1984 and found very high coefficients of variation in resource use within many DRGs. To the extent that such variation is due to differences in severity of illness within a DRG, it may be impossible for a hospital to conform to the average resource use established for that DRG.

Teaching hospitals offer many services that could be expected to attract more severely ill patients than community hospitals. Certainly, teaching hospital managers and physicians share a widespread belief that they treat sicker patients. In the study reported here, the authors attempted to clarify what is meant by severity of illness and to test the hypothesis that teaching hospitals treat a higher proportion of severe cases as determined by standards other then DRGs. Measures of severity of illness offer hospital managers an important tool for resource planning and control.

There is no general agreement on how severity of illness should be defined, and there are at least three views of what this definition could be. One approach is a system that categorizes patients in a way that maximizes homogeneity within groups with respect to the nature of their illness. Such a system examines the underlying condition of the patient, regardless of the degree of intervention. A second alternative is a classification system that not only considers the patient's condition but also accounts for the degree of intervention and the patient's response. A third option, as yet undeveloped, would be a system that measures severity of illness against an ideal amount of intervention for a specific disease rather than against actual averages for that disease.

## Method

For the study reported here, patients were classified using two well documented methods: "disease staging," developed by Gonnella and colleagues (3), and the se-

verity of illness index, developed by Horn at the Johns Hopkins University School of Public Health (4, 5). Disease staging represents a system that examines patient condition regardless of the degree of intervention, and the severity of illness index represents a system that accounts for the degree of intervention applied and the patient response.

Disease staging measures the severity of specific, well defined diseases, using coded criteria for 420 diagnoses. Gonnella and associates borrowed from clinical medicine (specifically oncology) the concept that during the course of a disease certain well delineated stages can be defined and detected clinically. These stages reflect the severity of the disease in terms of risk of death or residual impairment and have clinical significance for prognosis and choice of therapy (3). Disease staging criteria were developed for manual application to medical records and for software packages that utilize abstracts from computerized hospital discharge data.

In disease staging, diseases are categorized into four levels, each increasing in severity. Staging is independent of any expected response to therapy or of resources used. According to Gonnella, the system "is based on a conceptual model of the disease process itself rather than on the relative efficacy of medical technology" (3).

In the computerized version of disease staging, principal and secondary diagnoses are automatically selected by the computer programs. In view of the availability of computer systems to expedite processing, this version is less costly to apply to large data bases than the manual system.

Perhaps the greatest problem with the staging methodology is the fact that it examines each disease separately but does not link diseases to look at the total impact on the patient. That is, when the staging system is applied to a patient, only the principal identified condition is used in the severity measure, and other, secondary conditions unrelated to the principal illness are not reflected. Also, staging categories have not been developed for all diseases. For example, the diseases that have not been categorized comprised 15.6 per cent of the NYU Medical Center's hospital discharges, based on a two-month sample of 2,000 patients studied by the authors in 1984 during a study of disease staging of the medical center's patients.

Horn's severity of illness index (4, 5) was developed by a team of researchers, physicians, and nurses. It is a generic (not disease-specific), four-level index determined from the values of seven criteria related to "burden of illness." The four levels range from minor (level 1) to catastrophic (level 4). The seven criteria are: (*a*) stage of the principal diagnosis, (*b*) complications of the principal condition, (*c*) concurrent interacting conditions that affect the patient's health status, (*d*) patient's dependency on hospital staff, (*e*) extent of nonoperating room life-support procedures, (*f*) rate of response to therapy or rate of recovery, and (*g*) impairment remaining after therapy for the acute aspect of the disease.

To determine the severity of illness rating for each case, a medical records rater analyzes the patient chart after discharge. The rater first assesses the pattern of the seven criteria; then, based on evaluation of how each contributes to the hospitalization, the rater identifies a severity level for the admission. Horn's studies have shown that, of the seven criteria used to form an overall severity score, three of the criteria (complications, interactions, and rate of response to therapy) contrib-

ute more to overall severity level than the others.

The severity of illness index can be used for all categories of inpatients except psychiatric patients (4, 5). The seven criteria permit the index to be applied to multiple diagnoses, thus accommodating a significant percentage of the patient population in teaching hospitals where patients often have more than one diagnosis at the same time. The severity of illness system is expensive to use because it is not computerized and because retrospective chart reviews by trained raters is time and resource intensive.

To study disease staging for the present study, the authors analyzed 1.3 million hospital discharges in 1983 in the New York City area. Each patient discharge record was assigned a stage using the disease staging system. The computer processing and data collection were performed by a consulting firm based in New York City. Cases that could not be assigned a stage (because staging has not been developed for all diseases) were omitted from the sample. The sample was divided into teaching and nonteaching hospital cases, using membership in the Council of Teaching Hospitals (COTH) of the Association of American Medical Colleges as the criterion for determining the teaching hospitals. By this criterion, there were 49 teaching and 64 nonteaching hospitals in the sample.

Because the severity of illness index is not a computerized method, the same data base used for disease staging could not be examined using the index. Instead a sample of 54,000 discharge records from 13 hospitals throughout the country was used. All of these hospitals had trained raters who assigned the severity of illness ratings. Of the hospitals in the sample, 11 were teaching hospitals and two were nonteaching. Although a larger sample was preferable, no other hospitals used the severity of illness system.

To assess the financial impact of differences in the severity of patient illnesses, the authors analyzed 9,233 NYU Medical Center discharges over the six-month period from April to September 1984. Each discharge was assigned a severity of illness index rating. For this aspect of the study, deaths were omitted, and charges and average length of stay were used as measures of resource consumption. To compare severity levels within DRGs, the authors studied 1,115 of these cases in 15 DRGs. Each of the 15 selected DRGs had more than 30 cases and three or more cases in at least three severity levels.

### Results and Discussion

Table 1 presents the distribution of cases by severity and hospital type for disease staging and the severity of illness index. A chi-square test was used to determine whether the distribution of cases by severity level differed between the two types of hospitals. The results indicated that the overall distribution of severity was significantly different between teaching and nonteaching hospitals measured by both instruments. The disease staging method had a chi-square of 645.7 ($df = 4$, $p = .0001$); the severity of illness index had a chi-square of 1570.7 ($df = 3$, $p = .0001$).

The overall distribution of severity using disease staging differed significantly between the two types of hospitals. These differences were due to the slightly higher proportion of stage 3 cases and the lower proportion of stage 1 cases in the teaching hospitals. Although the differences were statistically significant, they were not dramatic. For instance, stage 1 patients in the nonteaching hospitals were only 1.3 percentage points more than in the teaching hospitals.

It is important to note that disease stag-

TABLE 1

Percentage of Cases at Each Level of Severity, as Measured by Disease Staging Method and Severity of Illness Index, at Selected Teaching and Nonteaching Hospitals, 1983–1984

| Measurement | Teaching Hospitals† | | Nonteaching Hospitals‡ | |
|---|---|---|---|---|
| | No. of Cases | Percentage | No. of Cases | Percentage |
| Severity of Illness Index* | | | | |
| Level 1 | 260,801 | 58.7 | 8,986 | 78.5 |
| Level 2 | 145,888 | 32.8 | 2,093 | 18.3 |
| Level 3 | 23,234 | 5.2 | 244 | 2.1 |
| Level 4 | 1,501 | 3.3 | 117 | 1.0 |
| Total | 431,943 | 100.0 | 11,418 | 100.0 |
| Disease Staging Method‡ | | | | |
| Stage 1 | 308,498 | 56.5 | 317,151 | 57.8 |
| Stage 2 | 108,901 | 20.3 | 114,356 | 20.8 |
| Stage 3 | 89,519 | 16.8 | 82,761 | 15.1 |
| Stage 4 | 33,840 | 6.4 | 34,384 | 6.4 |
| Total | 534,296 | 100.0 | 548,753 | 100.0 |

* Severity of illness index levels range from minimum severity (level 1) to catastrophic (level 4).

† In application of the severity of illness index, the number of teaching hospitals in the sample was 11, and the number of nonteaching hospitals was two; these hospitals were located throughout the country. In application of disease staging, the number of teaching hospitals was 49, and the number of nonteaching hospitals was 64; all of these hospitals were located in the New York City area.

‡ Disease staging levels range from no complications or minimal severity (stage 1) to death (stage 4).

ing is a disease-specific measure, yet the comparisons reported here were among the stages regardless of disease. A follow-up study is being done by the authors to compare the stage distribution within diseases between teaching and nonteaching hospitals.

The severity of illness index showed striking differences between the teaching and nonteaching hospitals. The teaching hospitals had a far larger share of level 2, 3, and 4 cases than the nonteaching hospitals. In levels 3 and 4 combined, the teaching hospitals had more than twice the number of cases (proportionally) than the nonteaching hospitals had. In evaluating these data, however, it must be remembered that the sample size of nonteaching hospitals was small.

The findings tend to confirm that teaching hospitals treat a case load with more severe cases than do nonteaching hospitals. Some limitations to the study should be noted, however. The disease staging sample was drawn only from New York City area hospitals, where nonteaching innercity hospitals may attract more severe cases than their counterparts nationally. Also, although the assignment of a disease stage is based on a particular disease, the study compares the stage distribution between hospitals, while the disease mix is not accounted for. The severity of illness index sample needs to be expanded to include a greater representation of nonteaching hospitals. The NYU Medical Center is developing a multistate data base which should resolve many of these problems in the follow-up study.

To assess the financial impact of differences in the severity of patient illnesses, the NYU Medical Center patient data were analyzed using average hospital charges and average length of stay as measures of resource consumption. The results (Table 2) showed that for every category of routine, ancillary, and total charges tracked, resource use increased dramatically with increasing severity of illness. The same was also true for average length of stay.

Similar results were obtained by examining severity levels within 15 DRG classifications. A pattern emerged in which charges rose with increasing severity levels for every DRG studied. (Figure 1 illustrates this finding for the first eight DRGs studied, given in numerical sequence). This variance in charges clearly indicates the potential financial impact of different severity distributions, because the variance could have major implications under a DRG-based system in which reimbursement is the same for all patients within a DRG regardless of the severity of the case. A hospital having a higher proportion of severely ill patients would be underpaid, while another hospital might be overpaid because its patients were less severely ill.

Severity of illness measures are a valuable tool for the internal management of hospital resources. Combined with DRGs, severity measures can yield a refined definition of the hospital's services and costs, and more exact definitions can significantly increase effective decision-making, resource allocation, and monitoring.

As noted previously, DRGs alone have high coefficients of variation in resource consumption. By combining severity of illness measures with DRGs, this variance can be significantly reduced and more homogeneous patient groups can be created. At the NYU Medical Center, the authors found that DRGs alone reduced variance of charges to patients to 40.5 percent. Adding disease staging categories to DRGs increased the reduction in variance to 54.3 percent, and combining the severity of illness index with DRGs increased the reduction in variance to 72.5 percent.

Although DRGs might be useful for allocating resources within an entire institution, at the level of the individual

TABLE 2

**Average Hospital Charges (in Dollars) for 9,233 Patients with Illnesses at Four Levels of Severity, as Measured by Severity of Illness Index, New York University Medical Center, April-September 1984***

| Source of Charge | Levels of Severity | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Service Charge | 1,979 | 6,803 | 17,004 | 32,762 |
| Operating Room Charge | 891 | 1,256 | 2,246 | 2,681 |
| Pharmacy (Drugs) | 150 | 684 | 2,003 | 4,748 |
| Radiology | 299 | 1,074 | 2,574 | 5,620 |
| Laboratory | 633 | 2,460 | 6,291 | 10,627 |
| Medical/Surgical Supplies | 281 | 1,201 | 3,103 | 5,063 |
| Physical and Occupational Therapy | 91 | 587 | 2,240 | 8,101 |
| Blood, Anesthesia, Other | 99 | 381 | 1,052 | 1,657 |
| Total Charges | 4,423 | 14,446 | 36,513 | 71,259 |

* Deaths were omitted. Average lengths of stay were calculated: level 1, 6.04 days; level 2, 19.76 days; level 3, 47.32 days; level 4, 77.00 days.

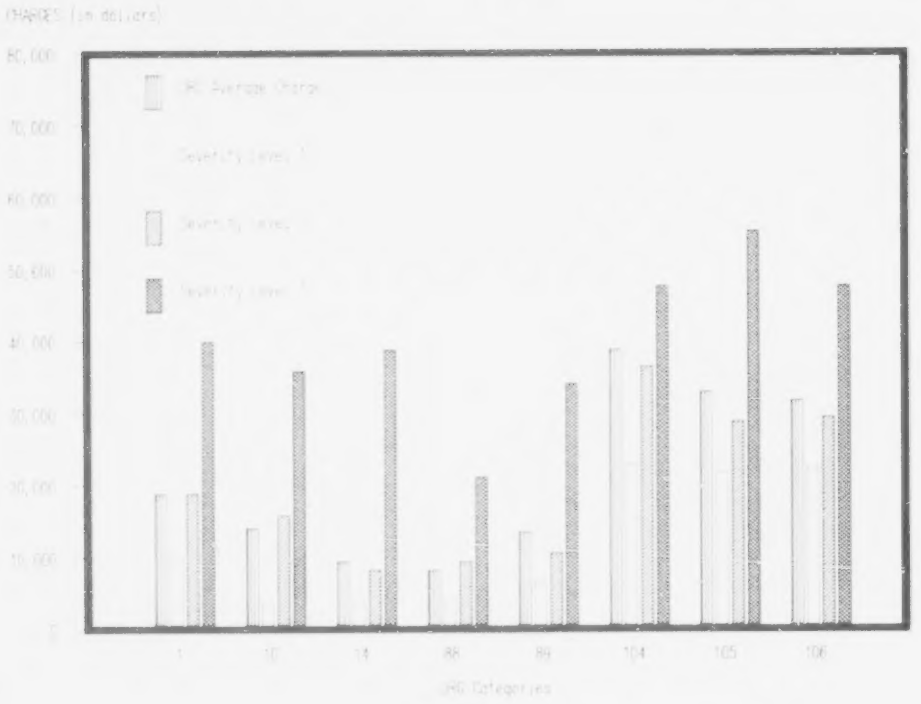


FIGURE 1

Comparison of average charges for all patients in a DRG with average charges for patients by severity level in same DRG using 584 patients in eight DRGs at three levels of severity of illness, as measured by severity of illness index, New York University Medical Center, April-September 1984 (DRG 1 pertains to craniotomy, 10 to nervous system neoplasms, 14 to cerebrovascular disorders, 88 to chronic obstructive pulmonary disease, 89 to pneumonia, 104 and 105 to cardiac surgery valve procedures, and 106 to coronary bypass surgery).

physician, severity of illness measures appear to be a better tool for predicting resource consumption of hospital facilities and services. The measures permit comparisons between a physician's practice pattern and a norm and introduce a method to determine whether a physician's claim that his patients are sicker than those of other physicians is true. For example, Figure 2 illustrates how a comparison of physicians' average costs of treating patients will differ if severity of illness is taken into account. To demonstrate this point, the authors studied the records of all patients in diagnosis related group 108 pertaining to cardiothoracic surgery procedures with heart pump at the NYU Medical Center during April-September 1984 and categorized the patients into the four levels of the severity of illness index. For comparison purposes, the record of one physician in treating patients in DRG 108 was selected to illustrate the impact of severity of illness on resource consumption. The DRG 108 patients of the one physician stayed an average of 3.4 days longer and consumed $3,204 more in ancillary services and $2,518 more in routine services than did the DRG 108 patients of all the physi-

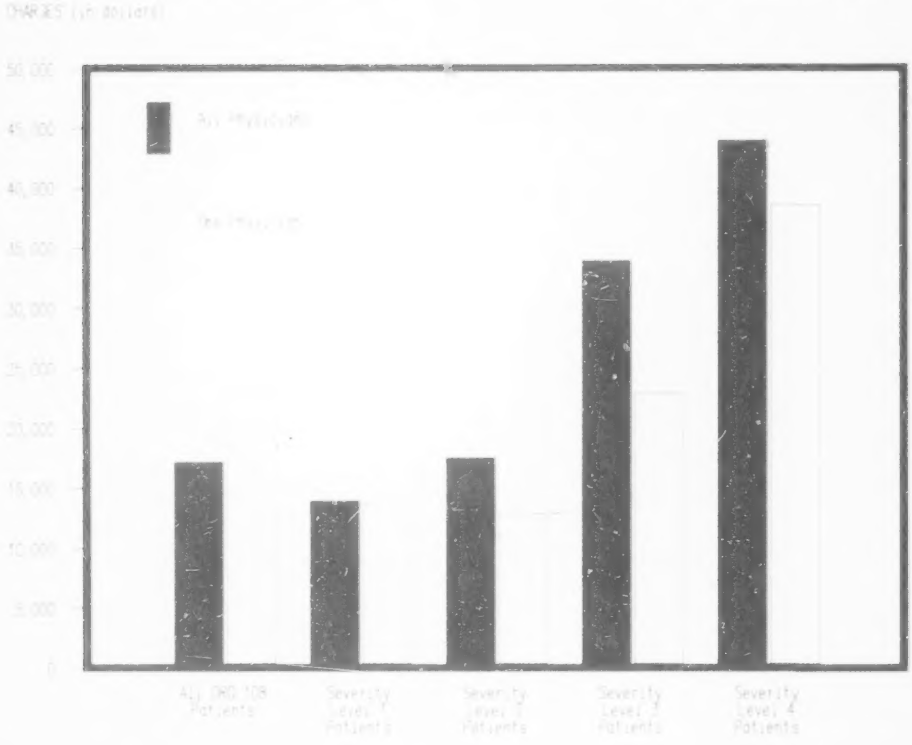


FIGURE 2

Average hospital charges of one physician and of all physicians in the treatment of patients in diagnosis related group number 108 pertaining to cardiothoracic surgery procedures with heart pump, compared by total average costs and by level of severity of illness, New York University Medical Center, April-September 1984 (the individual physician was selected to illustrate the impact of severity of illness case mix, as measured by severity of illness index, on resource consumption)

cians in the hospital. However, a comparison based on the severity of illness index levels showed that the one physician actually used proportionately fewer resources for his patients than all the physicians used for their patients. The single physician had appeared to be using more resources in the aggregate because he had a higher proportion of more severely ill patients than all the physicians.

## Conclusion

The preliminary study reported here indicated that at least one measure, the severity of illness index, showed highly significant differences between the severity of cases in teaching and nonteaching hospitals. Another measure, disease staging, also showed a difference, but further study is indicated because of the need to further separate patients by disease. Severity differences within a DRG can help account for wide variations in resource consumption. Such variations make severity measures important management tools for financial planning and resource consumption reviews with physicians.

The fixed-price per case reimburse-

ment system and the pressure on providers to reduce prices clearly threaten continuation of the practice of the teaching hospital to help finance resource-intensive tertiary services by overcharging for the less costly routine care services. This raises questions not only about the continued ability of the teaching hospital to fulfill its education and research missions but also about its capacity to be a financially viable competitor in attracting patients. In order to compete successfully for patients in providing those services also offered by nonteaching institutions, teaching hospitals must identify, quantify, and assure a source of financing for necessary activities unique to the teaching hospital. The refinement of severity of illness measures as part of management and reimbursement systems can be a large step in that direction. If severity of illness measures help describe the special burden of treatment that teaching hospitals bear, they should be used to establish the case for adequate financial support.

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# Factors Used by Program Directors To Select Residents

*Norma E. Wagoner, Ph.D., J. Robert Suriano, Ph.D., and Joseph A. Stoner*

**Abstract**—A national, stratified random sample of 405 graduate medical education program directors was surveyed on the way they selected their residents. The results from the 237 respondents reaffirm earlier studies which found that the interview was the most important selection variable. The results indicate that the recent increase in competition for residency positions has increased the importance of academic variables. For example, 86 percent of the respondents stated that they would not rank a candidate who had not passed the National Board of Medical Examiners Part I examination. Because 86 percent also stated that they give preference in ranking students to those who have done well in an elective at their hospitals, the senior year of medical school may be used as a "residency chase" rather than for the general professional education of the physician.

Within the last five years, there has been a decrease in the ratio of first-year residency positions to applicants. In 1980 the ratio was 1.33 positions per applicant, and by 1985 the ratio had dropped to 1.14 positions per applicant (1, 2). Consequently, many programs have become more competitive, and students are encountering more difficulty in obtaining positions in the programs of their choice. Residency directors, therefore, feel an increasing need for useful and valid information from medical schools, and medical students and their career advisers need to be better informed about the selection criteria for residency positions.

In 1978 Wagoner and Gray (3) surveyed a national random sample of 25 percent of the program directors in internal medicine, family medicine, surgery, and pediatrics. The program directors were asked to judge the importance of 31 variables in the selection of residents. A rank order of the variables placed interpersonal skills, as demonstrated in the interview, as the single most important selection criterion.

In an effort to determine whether significant changes in residency selection variables have occurred over the past seven years and to provide advisers and students with some assessment of the current trends in selection, the authors of the study reported here undertook a new survey.

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## Literature Survey

Many medical specialties have begun to assess the selection criteria and the degree to which the criteria predict the most successful resident for that specialty (4-6). In 1980 Leonard and Harris (4) examined the importance of various types of evidence and criteria used in the selection process and attempted to clarify the criteria and to generate new criteria. A survey of 24 full-time faculty members in a primary care internal medicine program at a University of Minnesota, Minneapolis, teaching hospital revealed that they gave highest ratings to the following: "good" grades in clinical work, "good" dean's letter, personal interview, "good" letters of recommendation, high internal medicine subscores on the National Board of Medical Examiners (NBME) Part II examination, high total scores on the NBME Part II examination, and knowing the person who recommended the student. When queried in open-ended questions about criteria that went beyond the rated items, the faculty members responded that the greatest weight was given to personal and interpersonal characteristics, which were felt to be more important than prior academic performance. When asked to list critical attributes in successful residents, they most commonly cited qualities needed to get the job done and qualities related to the learning process.

In 1983 Featherstone and Ramsey (5) analyzed selection criteria in order to determine the differences between primary care committees and other committees in their choices of important selection criteria for residents. Based on a limited sample of 17 faculty members from one institution, they concluded that the nonprimary care selection committees gave the greatest weight to the student's success in the internal medicine clerkship and to the strength of the recommendation letter from the department chairman. The primary care committees placed more emphasis upon the applicant's personal goals, skills, interests, and, especially, stated career goals. Another factor that appeared important to the nonprimary care selection committee was the perceived quality of the institution from which the student had received training.

A slightly different approach to viewing selection criteria was used by Clarke and Wigton (6) in their objective rating system developed for use in the selection of surgical residents. Five attributes were chosen as important in selection: knowledge, judgment, technical skills, work habits, and interpersonal skills. Twelve faculty members participated in their study, and 25 candidates were screened and evaluated. In the opinion of the faculty members, knowledge represented a third of the assessment weight, and knowledge plus judgment constituted about one half. As sources of information, approximately equal weight was allotted to dean's letters (to assess knowledge), the standard letters of recommendation or evaluation forms (to assess judgment and work habits), and the interview (to assess interpersonal skills).

## Method

In March 1984 the authors of the present study surveyed residency program directors in Ohio preliminary to a planned national survey in order to determine what trends and issues should be addressed. Surveys were mailed to 216 program directors in 16 specialty areas, and 125 surveys (58 percent) were returned. The program directors were asked to select those areas they considered the most important in choosing residents for their specialty. Based on the results of the Ohio

survey, the survey instrument was revised.

The revised questionnaire asked respondents to rate (on the basis of their experience in selecting residents scheduled to start in 1984) the importance of 48 resident selection variables which were mentioned in the previously cited literature or indicated as important in the Ohio preliminary survey. The importance was rated on the following scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, and 5 = critical. The respondents were also asked six yes-or-no questions regarding the weight they placed on specific academic credentials. Additionally, the survey asked the respondent's program type (university, community, or Veterans Administration) and open-ended questions regarding the number of positions offered, the number of completed applications, and the number of applicants interviewed.

Using the *1984–1985 Directory of Residency Training Programs* (7), the authors selected a stratified random sample of programs in internal medicine, pediatrics, surgery, obstetrics-gynecology, psychiatry, emergency medicine, family medicine, otolaryngology, and orthopedic surgery. The surveys were mailed to 405 program directors in September 1984, and 237 (59 percent) responded. Of the respondents, 45 percent were program directors, 23 percent were department chairmen, 15 percent were directors of resident education, and 17 percent directed other programs. Forty-six percent were at university-based hospitals, 52 percent at community-based hospitals, and 2 percent at Veterans Administration hospitals. The mean program size was 7.3 positions for postgraduate year (PGY) 1, 6.0 positions for PGY 2, and 2.4 positions for transitional programs (one or two years of training preliminary to entering a chosen specialty). The mean number of completed applications for all programs was 215.1, and the median was 150. The mean number of applicants interviewed per program was 85.5, and the median was 60.0.

## Results and Discussion

A limitation of the study was the sample size of the smaller specialties. Although each specialty was proportionally represented in the total response group, when the group was broken down by specialty, some of the resulting sample sizes may be too small to permit meaningful conclusions. Also, as typical of written surveys, not all respondents answered all questions. The study also did not question respondents about the applicants' demographic variables (age, sex, and race), which have been known to influence the selection process, because the investigators believed that the respondents would tend to give socially desirable responses.

There was more emphasis in this study on the applicant's academic record than was reported in 1979 by Wagoner and Gray (3). Therefore, the authors of the present study believed it desirable to compare the relative importance given to academic criteria by those specialties viewed as most competitive. A number of factors can be utilized to assess competitiveness of a specialty, but the one chosen for purposes of this study was the specialty's ability to fill its positions with U.S. graduates from accredited U.S. medical schools. An ability to fill positions with these candidates is considered a measure of success, since it is assumed that U.S. graduates are better trained to enter U.S. residencies than are non-U.S. graduates. The percentage of U.S. graduates holding positions in a specialty is described in

TABLE 1

**Mean Ratings of the Importance of 10 Academic Criteria in Selecting Residents as Reported in 1984 by a National Sample of Residency Program Directors in Specialties That Had More Than 80 Percent of Their Positions Filled with Graduates of U.S. Medical Schools in the 1985 Cycle of the National Residency Matching Program***

| Academic Criteria | Overall ($n = 89$) | | Emergency Medicine ($n = 8$) | | Obstetrics-Gynecology ($n = 31$) | | Orthopedics ($n = 15$) | | Otolaryngology ($n = 9$) | | Surgery ($n = 26$) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Grades in clerkships of program director's specialty | 3.91 | 0.80 | 3.63 | 0.52 | 3.87 | 0.67 | 3.93 | 1.22 | 4.00 | 0.71 | 4.00 | 0.75 |
| Grades in electives of program director's specialty | 3.81 | 0.91 | 3.88 | 0.64 | 3.68 | 0.87 | 4.13 | 1.19 | 4.00 | 0.87 | 3.69 | 0.84 |
| Rank order in class | 3.75 | 0.78 | 3.25 | 1.04 | 3.55 | 0.77 | 3.87 | 0.74 | 3.89 | 0.78 | 3.96 | 0.72 |
| NBME Part II scores | 3.64 | 0.85 | 3.38 | 0.74 | 3.48 | 0.85 | 3.60 | 1.06 | 3.78 | 0.83 | 3.91 | 0.73 |
| Grades in other clerkships | 3.55 | 0.76 | 3.75 | 0.46 | 3.52 | 0.77 | 3.47 | 0.99 | 3.89 | 0.78 | 3.62 | 0.64 |
| NBME Part I scores | 3.44 | 0.89 | 3.38 | 0.74 | 3.32 | 0.91 | 3.53 | 1.06 | 3.78 | 0.83 | 3.42 | 0.81 |
| Membership in Alpha Omega Alpha† | 3.44 | 1.20 | 2.88 | 1.36 | 2.93 | 1.16 | 3.73 | 1.16 | 3.56 | 1.13 | 3.92 | 1.23 |
| Grades in other electives | 3.13 | 0.82 | 3.00 | 0.93 | 3.06 | 0.77 | 3.20 | 1.01 | 3.56 | 0.73 | 3.08 | 0.74 |
| Grades in preclinical courses | 3.10 | 0.80 | 2.75 | 0.89 | 3.10 | 0.76 | 3.27 | 1.16 | 3.44 | 0.53 | 3.00 | 0.63 |
| Research activities | 2.85 | 0.88 | 3.13 | 0.99 | 2.52 | 0.96 | 2.87 | 0.92 | 3.44 | 0.73 | 2.96 | 0.77 |

* Rating scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, 5 = critical.

† Statistically significant difference in ratings among specialties, $p \leq .05$.

*National Residency Matching Program* (NRMP) data as the U.S. fill-rate (2).

Table 1 presents the ratings of academic criteria given by respondents representing specialties that filled at least 80 percent of their positions with graduates of U.S. medical schools in 1985. Of the five specialties compared in Table 1, only surgery and obstetrics-gynecology are usually taught in the third year of the medical school curriculum. Therefore, it is understandable that emergency medicine, orthopedics, and otolaryngology would rank grades in their specialty electives as high as or higher than the grades (if any) in the specialty's third-year clerkship. If a student selects a career specialty that is not in the curriculum before the fourth year, residency application deadlines place considerable pressure on that student to manage the initial quarter of the fourth year well. The problem is further exacerbated by those specialties (otolaryngology, for example) that do not participate in the NRMP and have earlier application deadlines. In these cases, students must complete relevant electives, submit residency application materials, and obtain a residency position within the first five months of the senior year.

Table 2 presents ratings of academic criteria given by respondents representing specialties that filled fewer than 80 percent of their positions with graduates of U.S. medical schools in 1985. A comparison of tables 1 and 2 shows that those specialties with more than 80 percent of their positions filled by U.S. graduates rated scores on the NBME parts I and II examinations, class rank, and membership in the Alpha Omega Alpha (AOA) honor medical society notably higher than did specialties with lower fill-rates (using Student's *t*-test, $p < .04$).

Although rank order in class was considered important, very important, or

TABLE 2

**Mean Ratings of the Importance of 10 Academic Criteria in Selecting Residents as Reported in 1984 by a National Sample of Residency Program Directors in Specialties That Had Less Than 80 Percent of Their Positions Filled with Graduates of U.S. Medical Schools in the 1985 Cycle of the National Residency Matching Program***

| Academic Criteria | Overall (*n* = 333) | | Family Practice (*n* = 90) | | Internal Medicine (*n* = 57) | | Pediatrics (*n* = 22) | | Psychiatry (*n* = 15) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Grades in clerkships of program director's specialty‡ | 4.01 | 0.77 | 3.72 | 0.76 | 4.39 | 0.73 | 3.91 | 0.81 | 3.43 | 0.94 |
| Grades in electives of program director's specialty | 3.56 | 0.81 | 3.49 | 0.94 | 3.58 | 0.78 | 3.64 | 0.73 | 3.57 | 0.65 |
| Grades in other clerkships | 3.49 | 0.67 | 3.36 | 0.63 | 3.65 | 0.69 | 3.50 | 0.60 | 3.21 | 0.80 |
| Rank order in class† | 3.37 | 0.90 | 2.87 | 0.86 | 3.81 | 1.01 | 3.55 | 0.74 | 2.71 | 0.73 |
| Grades in other electives | 3.08 | 0.69 | 3.00 | 0.73 | 3.18 | 0.66 | 3.10 | 0.62 | 2.93 | 0.83 |
| Membership in Alpha Omega Alpha‡ | 3.07 | 1.07 | 2.46 | 0.97 | 3.70 | 0.98 | 3.10 | 1.26 | 2.14 | 1.35 |
| NBME Part II scores† | 2.97 | 0.88 | 2.87 | 0.93 | 3.16 | 0.95 | 3.05 | 0.67 | 2.36 | 0.63 |
| Grades in preclinical courses | 2.95 | 0.72 | 3.08 | 0.66 | 2.93 | 0.75 | 2.91 | 0.68 | 2.71 | 0.83 |
| NBME Part I scores‡ | 2.87 | 0.91 | 2.74 | 0.99 | 3.12 | 0.91 | 2.86 | 0.79 | 2.21 | 0.80 |
| Research activities | 2.61 | 0.82 | 2.45 | 0.65 | 2.65 | 0.90 | 2.55 | 0.91 | 2.93 | 0.80 |

* Rating scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, 5 = critical.

† Statistically significant difference in ratings among specialties, $p < .05$.

‡ Statistically significant difference in ratings among specialties, $p < .01$.

critical by 86 percent of the respondents, the program directors reported they experienced great variation in the information schools provided concerning their students' positions in medical school classes. Miller and Leiden found that 58 percent of the medical schools responding to their 1984 national survey of deans of student affairs did not provide the student's class rank as part of their dean's letter information.* In light of the increased reliance of program directors on academic criteria, the relatively high importance assigned to NBME Part II examination scores, especially in the most competitive specialties (Table 1), is not surprising. Perhaps students who are considering the more competitive specialties should be advised of the weight given to these scores by program directors so that they consider taking the examination in time to have their scores available for program directors during the selection process.

From the series of yes-or-no questions, the authors wished to learn whether particular academic credentials influenced the program directors in selecting candidates for ranking in the residency match process. In the choices of the 237 respondents, there were no statistically significant differences between university and community hospital groups unless otherwise indicated. Responses to these questions, rank-ordered according to agreement or disagreement, were as follows:

1. Eighty-six percent gave preference in ranking to students who had done well in an elective in the program director's specialty and hospital.

2. Eighty-six percent would not rank

* Personal communication: Grant D. Miller, M.D., assistant dean for student affairs, and Lisa I. Leiden, Ph.D., evaluation coordinator, University of Nevada School of Medicine, Reno, Nevada, May 15, 1985.

an applicant who had failed the NBME Part I examination and had not successfully retaken it by the time of the interview.

3. Seventy-five percent would rank a candidate with an NBME Part I examination score in the 380–450 range. This response was made by 66 percent of the university hospitals and 82 percent of the community hospitals (Yates' corrected chi-square [$df = 1$] = 6.3, $p = .01$). The university hospital specialties in which fewer than 66 percent of the respondents would rank a candidate with these scores were orthopedics (33 percent), otolaryngology (50 percent), surgery (50 percent), internal medicine (57 percent), and obstetrics-gynecology (64 percent). In the community hospital programs, only orthopedics (33 percent) and surgery (40 percent) respondents had fewer than 66 percent who would rate students with these scores.

4. Fifty-five percent thought that honors grades in preclinical courses were more important than NBME Part I examination scores.

5. Forty-six percent would favor an applicant who had taken and passed the Part II examination of the NBME by the time candidates are ranked.

6. Forty-six percent selected applicants for the interview primarily on academic records. This breaks down to 54 percent for university hospitals and 39 percent for community hospitals (Yates' corrected chi-square [$df = 1$] = 4.9, $p = .03$).

Taking an elective in the program director's hospital and specialty seems to be of great importance; however, this should be interpreted cautiously, because the yes or no response did not permit the respondents to indicate uncertainty or indifference. Medical schools are concerned about the impact of the "residency chase" on the students' senior-year education. Many senior students are reported (8) to spend a considerable portion of their senior year taking electives in the specialty and the hospital in which they hope to influence the program director, faculty members, and residents with a high-quality performance. In the experience of the authors, more and more students are indicating that often the only reason they were given an interview at a hospital was because of the elective taken there. No national data have been gathered to indicate whether or not students are being denied interviews because they have not done an elective at the program director's hospital.

Because writing letters of recommendation is so time consuming, the authors of this study questioned program directors about their use of these letters. Table 3 lists the program directors' ratings of the importance of various letters of recommendation in their selection process. The table indicates that program directors tended to place greater importance on the chairman's letter than on the dean's letter (Student's *t*-test, $p = .001$ for combined group). The authors speculated that one reason is that the chairman may better understand the qualifications necessary for success in that specialty than would the dean. Another reason is that the chairman is perceived as feeling less compelled to act as an advocate for the student and can, therefore, present a more factual portrayal of the student's performance in courses of that specialty. Further, because department chairmen are often in personal contact with each other by telephone and at professional meetings, the authors believe that it is important to the program directors to maintain their credibility with each other by giving accurate evaluations. This finding suggests that deans of student affairs should make different recommendations to their students on whom to seek letters from.

Some medical students are now doing

TABLE 3

Mean Ratings of the Importance of Five Letters of Recommendation in Selecting Residents as Reported by a National Sample of Residency Program Directors, 1984*

| Source of Letter | Overall (n = 168) | | Family Practice (n = 39) | | Internal Medicine (n = 57) | | Obstetrics-Gynecology (n = 31) | | Pediatrics (n = 22) | | Psychiatry (n = 15) | | Surgery (n = 26) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Clinical faculty member in respondent's hospital in respondent's specialty | 3.91 | 0.85 | 3.85 | 0.90 | 3.86 | 0.80 | 4.07 | 0.92 | 3.91 | 0.61 | 3.79 | 0.58 | 4.00 | 0.98 |
| Chairman of department in respondent's specialty† | 3.90 | 0.79 | 3.61 | 0.98 | 4.04 | 0.73 | 3.94 | 0.73 | 3.90 | 0.70 | 3.58 | 0.67 | 4.15 | 0.73 |
| Dean | 3.71 | 1.00 | 3.67 | 1.08 | 3.93 | 2.00 | 3.42 | 0.92 | 3.73 | 0.94 | 3.60 | 1.12 | 3.69 | 0.93 |
| Clinical faculty member in respondent's specialty | 3.64 | 0.83 | 3.80 | 0.91 | 3.79 | 0.70 | 3.58 | 0.99 | 3.67 | 0.66 | 3.47 | 0.74 | 3.65 | 0.94 |
| Clinical faculty member in another specialty† | 2.91 | 0.68 | 3.06 | 0.68 | 2.95 | 0.59 | 2.77 | 0.80 | 3.14 | 0.39 | 3.07 | 0.59 | 2.54 | 0.65 |

* Rating scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, 5 = critical

†Statistically significant difference in ratings among specialties, $p < .05$

"mini-residencies" in their specialty choice in order to obtain the desired letters. Such early specialization jeopardizes the opportunity to obtain a broad clinical education. The Project Panel on the General Professional Education of the Physician has recommended that students "concentrate their elective programs on the advancement of their general professional education rather than on the pursuit of a residency position" (9).

Because the dean's letter is the letter of recommendation most likely of all letters from a medical school to be influenced by medical school policies, the survey asked the program directors to rate the importance of various types of information which could be included in the dean's letter. Although Table 3 indicates that the dean's letter is still important, Table 4 indicates that the importance would be increased by the addition of more refined and objective academic information that would help identify the problem student. One of the major criticisms of dean's letters is that they tend to be bland or give only the positive characteristics of the applicant (10). This raises the issue of whether deans of student affairs should be student advocates or factual reporters, for if a letter contains too many unfavorable facts about a student, the student may not be admitted to a residency.

As Table 4 shows, the presence of a signed waiver that the student had not viewed the dean's letter appeared to be relatively unimportant to program directors. Many deans of student affairs believed it was important for students to know what was written about them so that they could be as realistic as possible in selecting programs.

The 1978 study by Wagoner and Gray (3) showed that the interview was considered the most important selection criterion. In the study reported here, the authors asked more detailed questions about the interview in an attempt to define the applicant characteristics considered important by program directors during the interview. A comparison of Table 5 with tables 1 through 4 indicates that the interview-related items tended to be rated as more important than academic criteria or letters of recommendation. This finding is consistent with the previous studies. It must be noted, however, that academic criteria and letters of recommendation were very important in determining who would be interviewed. The data suggest that an applicant who is interviewed and does well may have a better chance to be selected than an academically stronger competitor who does less well in the interview. This conclusion is consistent with the findings of Leonard and Harris (4). The applicant's compatibility with the program was rated as the most important variable determined by the interview. Although not surprising, this leads to the question of how compatibility is assessed. (No effort was made to define compatibility in the questionnaire designed by the authors.) The authors of the present study strongly advocate that residency directors define compatibility in terms of their own selection process.

The importance of the candidate's maturity and commitment to hard work (especially for surgery) was also stressed by program directors. Again, a determination of how maturity is evaluated in the interview process is important. Medical school admissions committees have been grappling with this criterion for medical school applicants for many years, and program directors should examine their standards and procedures.

## Conclusions and Recommendations

The dramatic increase in competition for residency positions has increased the fo-

TABLE 4

Mean Ratings of the Importance of Information in Dean's Letter as Reported by a National Sample of Residency Program Directors, 1984*

| Information | Overall (n = 390) | | Family Practice (n = 59) | | Internal Medicine (n = 97) | | Obstetrics-Gynecology (n = 31) | | Pediatrics (n = 22) | | Psychiatry (n = 15) | | Surgery (n = 26) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Hints of underlying problems‡ | 3.96 | 0.88 | 3.80 | 0.99 | 4.23 | 0.77 | 3.87 | 0.88 | 3.82 | 0.66 | 3.00 | 1.00 | 4.16 | 1.03 |
| Comments on consistency of performance‡ | 3.86 | 0.71 | 3.76 | 0.85 | 4.02 | 0.59 | 3.77 | 0.67 | 3.68 | 0.72 | 4.07 | 0.80 | 3.81 | 0.69 |
| Negative comments‡ | 3.84 | 0.83 | 3.87 | 0.81 | 4.03 | 0.80 | 3.71 | 0.90 | 3.57 | 0.75 | 3.47 | 0.83 | 3.85 | 0.92 |
| Highly laudatory comments from members of respondent's specialty‡ | 3.71 | 0.88 | 3.71 | 0.93 | 3.58 | 0.91 | 3.71 | 0.94 | 3.73 | 0.70 | 3.93 | 0.80 | 3.88 | 0.86 |
| Overall rating based on all students in the class‡ | 3.65 | 0.98 | 3.43 | 1.01 | 3.91 | 0.90 | 3.61 | 0.95 | 3.52 | 0.93 | 3.07 | 1.03 | 3.92 | 1.15 |
| Narrative description of performance in each rotation | 3.39 | 0.84 | 3.45 | 0.89 | 3.30 | 0.88 | 3.39 | 0.80 | 3.41 | 0.67 | 3.67 | 0.82 | 3.12 | 0.88 |
| Personal comments on applicant | 3.38 | 0.92 | 3.45 | 0.95 | 3.51 | 0.87 | 3.19 | 0.98 | 3.19 | 0.81 | 3.87 | 0.83 | 3.08 | 1.08 |
| Comments on completion of curriculum in prescribed time | 3.31 | 0.97 | 3.42 | 1.00 | 3.53 | 0.84 | 3.39 | 1.05 | 2.82 | 0.96 | 3.07 | 0.70 | 3.56 | 1.19 |
| Delineated rank order of the candidate‡ | 3.28 | 0.94 | 2.29 | 0.84 | 3.49 | 0.95 | 3.26 | 1.03 | 3.50 | 0.67 | 2.60 | 1.06 | 3.79 | 1.10 |
| Signed waiver indicating student has not viewed the letter | 2.26 | 1.28 | 2.50 | 1.11 | 2.45 | 1.43 | 2.26 | 1.26 | 1.86 | 1.04 | 1.73 | 1.22 | 2.16 | 1.40 |

* Rating scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, 5 = critical

† Statistically significant difference in ratings among specialties, $p < .05$.

‡ Statistically significant difference in ratings among specialties, $p < .01$.

TABLE 5

Mean Ratings of the Importance of 15 Applicant Characteristics Evaluated in Interviews of Residency Applicants as Reported by a National Sample of Residency Program Directors, 1984*

| Applicant Characteristic | Overall (n = 1901) | | Family Practice (n = 391) | | Internal Medicine (n = 571) | | Obstetrics/ Gynecology (n = 211) | | Pediatrics (n = 223) | | Psychiatry (n = 153) | | Surgery (n = 261) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Compatibility with program† | 4.47 | 0.61 | 4.69 | 0.47 | 4.30 | 0.68 | 4.55 | 0.51 | 4.50 | 0.74 | 4.60 | 0.63 | 4.35 | 0.63 |
| Ability to grow in knowledge | 4.34 | 0.65 | 4.44 | 0.68 | 4.29 | 0.53 | 4.30 | 0.79 | 4.36 | 0.58 | 4.20 | 0.77 | 4.42 | 0.58 |
| Maturity | 4.31 | 0.58 | 4.51 | 0.56 | 4.32 | 0.57 | †4.35 | 0.61 | 4.23 | 0.53 | 4.07 | 0.59 | 4.12 | 0.65 |
| Commitment to hard work‡ | 4.29 | 0.65 | 4.13 | 0.73 | 4.31 | 0.60 | 4.43 | 0.73 | 4.30 | 0.61 | 4.00 | 0.76 | 4.71 | 0.46 |
| Fund of knowledge | 4.12 | 0.67 | 4.05 | 0.83 | 4.13 | 0.51 | 4.17 | 0.75 | 4.10 | 0.68 | 3.93 | 0.59 | 4.28 | 0.61 |
| Ability to solve problems* | 4.08 | 0.67 | 4.00 | 0.79 | 4.25 | 0.52 | †3.75 | 0.74 | 4.18 | 0.66 | 3.93 | 0.80 | 4.20 | 0.58 |
| Willingness to seek help† | 4.07 | 0.72 | 4.38 | 0.59 | 4.09 | 0.71 | 3.87 | 0.81 | 4.00 | 0.62 | 3.93 | 0.70 | 3.92 | 0.84 |
| Ability to articulate thoughts | 4.03 | 0.67 | 4.00 | 0.83 | 4.05 | 0.55 | 3.87 | 0.72 | 4.00 | 0.69 | 4.20 | 0.68 | 4.12 | 0.59 |
| Sensitivity to other's psychosocial needs† | 3.84 | 0.78 | 4.15 | 0.84 | 3.88 | 0.83 | 3.48 | 0.85 | 3.81 | 0.60 | 4.40 | 0.63 | 3.42 | 0.70 |
| Realistic self-appraisal | 3.79 | 0.85 | 4.08 | 0.96 | †3.77 | 0.60 | 3.61 | 0.93 | 3.71 | 0.78 | 3.67 | 0.82 | 3.77 | 1.03 |
| Personal appearance and professional style | 3.77 | 0.80 | 3.85 | 0.93 | 3.63 | 0.70 | 3.97 | 0.91 | 3.59 | 0.73 | 3.67 | 0.82 | 3.92 | 0.69 |
| Ability to listen‡ | 3.74 | 0.69 | 4.13 | 0.66 | 3.67 | 0.64 | 3.52 | 0.89 | 3.50 | 0.60 | 4.13 | 0.52 | 3.58 | 0.70 |
| Relevant questions asked | 3.65 | 0.79 | 3.88 | 0.86 | 3.63 | 0.79 | 3.58 | 0.72 | 3.27 | 0.88 | 3.93 | 0.59 | 3.58 | 0.76 |
| Level of confidence | 3.55 | 0.72 | 3.62 | 0.81 | 3.54 | 0.63 | 3.42 | 0.76 | 3.52 | 0.68 | 3.33 | 0.72 | 3.77 | 0.71 |

* Rating scale: 1 = unimportant, 2 = some importance, 3 = important, 4 = very important, 5 = critical.

† Statistically significant difference in ratings among specialties, $p < .05$.

‡ Statistically significant difference in ratings among specialties, $p < .01$.

cus on academic criteria during the seven years since the Wagoner and Gray study of 1978 (3), although the interview remains as the most important selection criterion. Consequently, the importance assigned to various selection criteria does not differ among specialties as much as one might have anticipated. Students are now more likely to have to consider more than one specialty option. It would be helpful for all concerned—students, deans of student affairs, student advisers, and program directors—if the qualifications sought by individual programs were published and distributed.

The interview process is both time consuming and expensive to students and program directors. Students need to be aware of the criteria that are most important during the interview, and they need to make a critical self-analysis of their career goals.

Because the competition for residency positions has increased greatly for many of the specialties, students are applying to more programs than they did in the past, significantly increasing the work load for program directors. Students report that many interviews are granted on a first-come-first-served basis, which causes them to apply earlier than they might otherwise. Pressure from programs outside the NRMP that notify students of their selection decisions five months into the senior year has further heightened anxiety, and this anxiety appears to be spreading to the entire process.

In order to do more than a superficial evaluation of a career area, students need earlier elective experiences or they will be forced to make premature decisions on limited information. Many medical schools have made substantial curriculum changes in their third-year programs in order to meet the demands being placed upon them by residency program directors, changes that tend to move in a direction opposite to the stated national goals of achieving the general professional education of the physician (9).

The whole area of graduate medical education is in transition, and further reduction of residency positions seems imminent. Until medical school enrollments are also reduced, students will likely face increased competition to obtain the specialty training of their choice. Students are already beginning to assess and seek the specialty they can get into rather than the medical field for which they may be best suited. This could create a greater number of dissatisfied physicians. Now may be the time to review the resident selection process and to improve the National Residency Matching Program so that all specialties will take part in it, thereby providing all students and program directors equal access to each other.

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# DATAGRAM

## Reapplicants to U.S. Medical Schools, 1981 Through 1984

Although most applicants to medical school in a given year are applying for the first time, a substantial number are reapplying after an unsuccessful attempt in a previous year. Since these reapplicants are in general less successful than first-time applicants in gaining admission, the overall statistics covering both kinds of applicants that are published in the annual editions of *Medical School Admission Requirements* (1) and the annual education issues of the *Journal of the American Medical Association* (2) may portray a bleaker picture of the difficulty of achieving entry to medical school than is warranted.

Until recently, good statistical information on reapplicants was difficult to derive because it required combining information collected in several application years. However, with completion of the Student and Applicant Information Management System of the Association of American Medical Colleges, collated data on all applicants to U.S. medical schools since 1973 are now available. The report presented here includes information on applicants for the entering classes of 1981 through 1984 but takes into account previous applications since 1978. Less complete information on reapplicants for earlier years was included in previous AAMC publications (3, 4).

### Method

For each application year, a previously unsuccessful applicant was defined as an individual who had also applied in one or more of the preceding three years. Although this approach may have resulted in identifying as a first-time applicant the rare individual who may have applied again after a hiatus of more than three years, it allowed consistent treatment of each of the four application years in the study. Thus, for example, for 1981 a previously unsuccessful applicant was one who had applied at least once in the years 1978 through 1980 and again in 1981; and for 1984 a previously unsuccessful applicant was one who had applied at least once in 1981 through 1983 and again in 1984.

The previously unsuccessful applicants were further subdivided into those who applied in only one prior year and those with several prior applications. The group of those who had applied in one prior year was further subdivided into those applying in the previous year only and those applying in an earlier single year.

Previously matriculated applicants were the small number of applicants each year who had attended medical school during the previous three years but had dropped out or had been dismissed. Previously accepted applicants were those who had received an acceptance in one of the previous three years but had not matriculated. Many of these previously accepted students had been granted delays in matriculation by the school that originally accepted them.

The remainder of the students, that is, those who had no record of an application within three years, were considered first-time applicants. All of the categories are mutually exclusive; thus, the sum of the numbers of applicants, accepted students, or matriculants in all the categories is equal to the number of all applicants, all accepted students, or all matriculants, respectively. The percentage accepted in each category is the number who were accepted divided by the number of applicants, and the percentage matriculated is the number who matriculated divided by the number of applicants.

### Results and Discussion

As shown in Table 1, the aggregate number of applicants, accepted students, and matriculants all declined very slightly over the four-year period ending in 1984. The number of applicants declined by 2.1 percent, the number accepted by 1.8 percent, and the number

**TABLE 1**

**Numbers and Percentages of Applicants to U.S. Medical Schools, by Application Status, 1981 Through 1984**

| Applicants' Status | 1981 | | 1982 | | 1983 | | 1984 | |
|---|---|---|---|---|---|---|---|---|
| | No. | Percent. | No. | Percent. | No. | Percent. | No. | Percent. |
| First-time applicants | | | | | | | | |
| Applied | 26,621 | 100.0 | 25,597 | 100.0 | 25,317 | 100.0 | 26,059 | 100.0 |
| Accepted | 13,761 | 51.7 | 13,588 | 53.1 | 13,444 | 53.1 | 13,520 | 51.9 |
| Matriculated | 13,272 | 49.9 | 13,036 | 50.9 | 12,878 | 50.9 | 12,927 | 49.6 |
| Previously unsuccessful applicants | | | | | | | | |
| One prior application | | | | | | | | |
| In year prior | | | | | | | | |
| Applied | 5,516 | 100.0 | 5,660 | 100.0 | 5,178 | 100.0 | 5,341 | 100.0 |
| Accepted | 2,061 | 38.4 | 2,280 | 40.3 | 2,065 | 39.9 | 2,082 | 39.0 |
| Matriculated | 2,061 | 37.4 | 2,203 | 38.9 | 1,999 | 38.6 | 1,997 | 37.4 |
| In other year | | | | | | | | |
| Applied | 1,643 | 100.0 | 1,485 | 100.0 | 1,678 | 100.0 | 1,594 | 100.0 |
| Accepted | 428 | 26.0 | 424 | 28.5 | 516 | 30.7 | 460 | 28.9 |
| Matriculated | 412 | 25.1 | 399 | 26.9 | 493 | 29.4 | 441 | 27.7 |
| Two or three prior applications | | | | | | | | |
| Applied | 2,376 | 100.0 | 2,306 | 100.0 | 2,284 | 100.0 | 2,199 | 100.0 |
| Accepted | 713 | 30.0 | 680 | 29.5 | 765 | 33.5 | 716 | 32.6 |
| Matriculated | 690 | 29.0 | 659 | 28.6 | 742 | 32.5 | 686 | 31.2 |
| Previously accepted applicants | | | | | | | | |
| Applied | 280 | 100.0 | 340 | 100.0 | 434 | 100.0 | 446 | 100.0 |
| Accepted | 241 | 86.1 | 281 | 82.6 | 388 | 89.4 | 388 | 87.0 |
| Matriculated | 213 | 76.1 | 246 | 72.3 | 351 | 80.9 | 328 | 73.5 |
| Previously matriculated applicants | | | | | | | | |
| Applied | 291 | 100.0 | 342 | 100.0 | 309 | 100.0 | 306 | 100.0 |
| Accepted | 23 | 7.9 | 41 | 12.0 | 31 | 10.0 | 28 | 9.1 |
| Matriculated | 12 | 4.1 | 24 | 7.0 | 17 | 5.5 | 16 | 5.2 |
| All applicants | | | | | | | | |
| Applied | 36,727 | 100.0 | 35,730 | 100.0 | 35,200 | 100.0 | 35,944 | 100.0 |
| Accepted | 17,286 | 47.1 | 17,294 | 48.4 | 17,209 | 48.9 | 17,194 | 47.8 |
| Matriculated | 16,660 | 45.4 | 16,567 | 46.4 | 16,480 | 46.8 | 16,395 | 45.6 |

matriculated by 2.6 percent. The overall probability of gaining admission ranged between 45.4 and 46.8 percent during 1981–1984.

First-time applicants were 72.5 percent of all applicants in 1984 but were 79.7 percent of matriculants. The proportion of first-time applicants accepted in 1984 was 51.9 percent, which was substantially higher than for any of the groups of previously unsuccessful applicants.

In 1984, 39 percent of the individuals who applied for the second consecutive year were accepted, while only 28.9 percent of those who applied for the second time after a hiatus were accepted.

More than 2,000 of the applicants who applied each year were doing so for at least the third time. These individuals had a considerably lower chance of success than first-time applicants, but almost one-third of them did eventually gain acceptance and matriculate. Including these and the other reapplicants in the aggregate statistics for applications gives first-time applicants an incorrect impression of their chances of acceptance, but the error is not as great as might have been feared.

The previously accepted group had an acceptance rate in 1984 of 87.0 percent, which is higher than that of any of the other groups reported. However, many of these individuals

had been granted deferred matriculation by the school that originally accepted them. The authors have not analyzed the data to separate those previously accepted at the same school from those previously accepted at another school or to separate those already accepted in the previous year from those accepted in an earlier year. This group of previously accepted applicants is small but definitely growing, rising from 280 in 1981 to 446 in 1984. Over 15 percent of the individuals accepted from this group in 1984 did not matriculate; in contrast less than 5 percent of accepted first-time applicants that year failed to matriculate.

The previously matriculated applicants were unlikely to gain a second chance at medical education. Only 9.1 percent were accepted in 1984, and only 5.2 percent matriculated.

To summarize, almost three quarters of all applicants in any given year are first-time applicants. Reapplicants have a smaller but still good chance of acceptance. The data describing all applicants show a somewhat lower probability of gaining acceptance to medical school than do the data describing first-time applicants.

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